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(71) Applicant: **E. FISCHER AG**
SFI-SCHLEIFSPINDELFABRIK
Birkenweg 2
CH-3363 Oberoenz (CH)

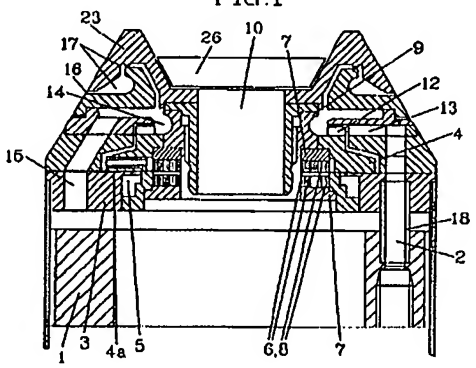
(72) Inventor: **Lind, Björn**
Billdals Häggväg 8
S-427 00 Billdall (SE)

(74) Representative: **AMMANN**
PATENTANWAELTE AG BERN
Schwarztorstrasse 31
CH-3001 Bern (CH)

(54) A spray painting nozzle.

(57) A spray painting nozzle designed as a spindle supported in a gas bearing and incorporating a stationary part (3) and a part (4) rotatably supported in relation thereto, which latter carries a rotatable spray painting cup (26) adapted to be driven by a drive unit (12), whereby the spray painting cup (26) is equipped with a supporting system comprising mutually plane-parallel bearing surfaces formed in the stationary and in the rotatable parts, and with means (2,5) for supply of a gaseous medium for causing a slot generated as an axial gas bearing therebetween, the rotatable part being radially guided by a magnetic force for centering the rotatable part in relation to the stationary part, said supporting system further being equipped with symmetrically provided holder magnets (6) for limitation of the size of said slot, and where for supply of spray medium to the spray painting cup (26), there is provided a supply path (10) extending through the plane (4a) of the gas bearing.

FIG.1



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The present invention refers to a spray painting nozzle designed as a spindle supported in a gas bearing and of the type provided with a rotatable spray painting cup, referred to as a spray painting bell and in accordance with the preamble of the accompanying claim 1.

Such a spray painting nozzle incorporates a painting cup rotatably supported at a stationary part, and equipped with a number of openings provided in the inner surface of the cup, through which openings the medium to be sprayed is fed out during operation.

In order to give the medium fed out a desired dispersion it is required that the cup rotates at a very high speed, and for this reason very high demands are put on the supporting and driving thereof.

It is earlier known to use gas bearings for axial supporting of other types of rotating systems, whereby a gas is introduced under pressure between the mutually plane-parallel surfaces in the stator and rotor for creating a thin slot between the surfaces. This type of supporting gives low friction and good operational behaviour also at very high speeds. The size of the bearing slot is preferably limited by magnetic forces.

US-A-4,467,968 refers to a rotary type electrostatic spray painting device having a rotary shaft supported in radial and axial air bearings and being centered by magnetic forces. The spray sup-shaped head of the device is fixed to the front end of the rotary shaft, and the medium to be sprayed is introduced in the spray head from the side via a nozzle affixed to the non-rotary part of the device and projecting laterally from the side into a chamber in the spray head. With this design the supply of paint sidewise into the spray head, which rotates at very high speed, will cause problems and may cause unbalance.

Purpose and most essential features of the invention

The purpose of the invention is to provide a spray painting nozzle, which can be driven at very high speeds (up to 100.000 rpm) without giving problem regarding the supply of the medium to be sprayed, unbalance and the like and this has been achieved in that the spray painting nozzle has been given the features stated in the accompanying claim 1.

Description of the drawings

Hereinafter the invention will be further described with reference to embodiments shown in the accompanying drawings.

Fig. 1 shows in a vertical cross-section a spray painting nozzle according to the invention.

Fig. 2 is an enlarged part view of the nozzle according to Fig. 1,

Fig. 3 is a cross-section corresponding to Fig. 1 through a second embodiment of the invention, and

Fig. 4 shows the possibility of providing the spray painting nozzle according to the invention with different types of spray painting units.

Brief description of preferred embodiments

Fig. 1 shows schematically in cross-section an embodiment of a gas-supported spindle according to the invention, and which incorporates a supporting structure 1 with a number of channels 2 for pressurized gas, preferably compressed air, whereby in the drawing is shown only one such channel, whereas the structure may incorporate e.g. six such channels, arranged spaced apart along a substantially round path. The supporting structure 1 carries a lower, non-rotatable part 3 of a gas bearing, the other, rotating part 4 of which has a bearing surface, which is plane-parallel to the bearing surface of the stationary lower part. One of the not shown gas channels opens in an annular chamber 5, provided in the stationary bearing part, and communicating via not shown openings with the plane 4a of the gas bearing, and when the pressurized gas is pressed in between the bearing surfaces, these surfaces are urged apart axially thus that a thin slot is created between the bearing surfaces. In connection to the bearing surfaces there is arranged a number of magnets 6 positioned symmetrically about the centre of rotation, which magnets are mutually interconnected by means of short-circuiting rings 7, and intended to limit the size of the slot. Furthermore there are magnets 8 adapted to exert a magnetic force, which centers the rotating part in relation to the stationary part. The rotating bearing part 4 is connected to an internally threaded rotor part 9, in which is screwed in a detachable outer rotor part 23 having an internal, central axial through-channel, which functions as a supply path 10 for the medium to be sprayed, and which acts as a holder for a spray painting cup 26. The cup 26 may alternatively be a part integral with the outer rotor part.

In the embodiment shown the rotating bearing part 4 is equipped with structures 12 acting as turbine blades and in the stationary part is provided with at least one, and preferably several symmetrically arranged turbine inlets 13, which communicate with one of said gas channels 2 each. Alternatively the internally threaded rotor part may be equipped with said structures 12.

The stationary part is provided with internally opening exhaust channels 14, 15 for the driving gas of the turbine blades, at the same time as the stationary part and the detachable rotor part are designed to form a slot-shaped outlet 16 with a sealing labyrinth 17 between them.

In the embodiment shown, the channels 2 for supply of gas to the bearing, to turbine blades, and

possibly also for a not further shown brake device, are arranged to extend through spring-elastic damper means 18 provided as elastic suspensions for the stationary part relative to the supporting structure.

Fig. 2 shows in bigger scale a detail from Fig. 1, whereby in one of the bearing parts, here in the rotating part, is provided a small chamber 19, open towards the bearing surface, and which during operation by the pressure gas will obtain the same overpressure, as that prevailing between the bearing surfaces. In the other bearing part, in the example shown, the stationary part, there is provided a thin channel 20 communicating with the surroundings, in a position, which means that the chamber 19 during the rotation of the rotating bearing part, once per rotation over 360° will be situated jest in front of the thin channel 20, whereby the pressure in the chamber is reduced rapidly resulting in a pressure shock, which can be detected at the end of the channel facing away from the chamber. This detection may be used as an indication or recording of the current rotational speed by means of a not shown device, e.g. a microphone, a pressure sensitive sensor or the like.

In the embodiment of the spray painting nozzle shown in Fig.s 1 and 2, the turbine blades are provided adjacent the forward end of the nozzle, i.e. after the gas bearing and the stacks of magnets, but as shown in a modified embodiment in Fig. 3, the turbine blades 21 and their air inlets 22 may very well be arranged at the rearward part of the rotating part 23, i.e. before the gas bearing 24 and the stack of magnets, and it is also quite possible to drive the rotating part by letting it be the rotor of an electro motor, the stator of which is provided in or forms a portion of the stationary part.

In Fig. 4 is shown an embodiment of the spray painting nozzle according to the invention corresponding to that according to Fig. 1, wherein there is provided in the supply path 10 for the spray medium a supply tube 25, which extends through the plane 4a of the gas bearing and is surrounded by the gas bearing, and to which can be connected different spray painting units 26 of appropriate design for different painting purposes. Hereby it should be observed that the rotating part 23 may be designed with a spray painting cup integral therewith or may be provided with and carry a separate spray painting cup 26.

Claims

1. A spray painting nozzle designed as a spindle supported in a gas bearing and incorporating a stationary part (3) and a part (4) rotatably supported in relation thereto, which latter carries a rotatable spray painting cup (26) adapted to be driven by a drive unit (12), and wherein the spray painting cup (26) is equipped with a supporting system comprising mutually plane-parallel bearing surfaces formed in the stationary and in the rotatable parts, and with means (2,5) for supply of a gaseous medium for causing a slot generated as an axial gas bearing therebetween, the rotatable part being radially guided by a magnetic force for centering the rotatable part in relation to the stationary part,
characterized therein,
that the supporting system further incorporates symmetrically provided holder magnets (6) for limitation of the size of the slot created by said gas bearing, and that for supply of spray medium to the spray painting cup (26), there is provided a supply path (10) extending through the plane (4a) of the gas bearing.

2. A spray painting nozzle according to claim 1,
characterized therein,
that the stationary part (3) is equipped with a central axial through-channel for supply of spray medium to a central axial channel (10) in the rotatable part (4).

3. A spray painting nozzle according to claim 1 or 2,
characterized therein,
that the rotatable part (4) is provided with structures designed as turbine blades (12), and that in the stationary part (3) are provided at least one turbine nozzle (13) adapted to supply driving medium to said structures for driving the rotatable part.

4. A spray painting nozzle according to anyone of the preceding claims,
characterized by,
a damping system (18) adapted during operation to give a smooth running of the rotatable part (4) about its mass centre as soon as a critical rotational speed lower than the intended working speed has been exceeded.

5. A spray painting nozzle according to anyone of claims 1 to 3,
characterized therein,
that the stator part (3) is provided with a damping system in form of elastic dampers (18) and spring members adapted during operation to give the rotor a smooth running about its mass centre as soon as a critical rotational speed lower than the intended working speed has been exceeded.

6. A spray painting nozzle according to anyone of the preceeding claims,
characterized therein,
that a chamber (9) is provided in at least one of the gas bearing surfaces, which chamber is adapted during operation to take up the overpres-

sure prevailing in the gas bearing, and adapted during the relative rotation of the bearing parts (3,4) at least once during rotation over 360° to be brought in communication with at least one opening (20), freely communicating with the surrounding atmosphere, for creating pressure shocks intended for indication and/or recording of the rotational speed.

FIG.1

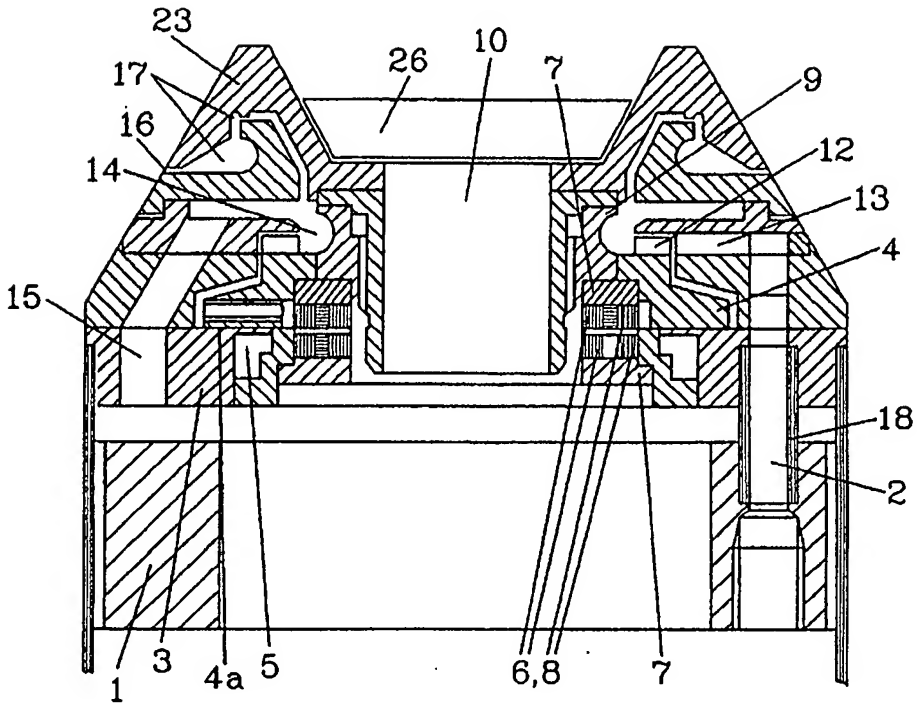


FIG.2

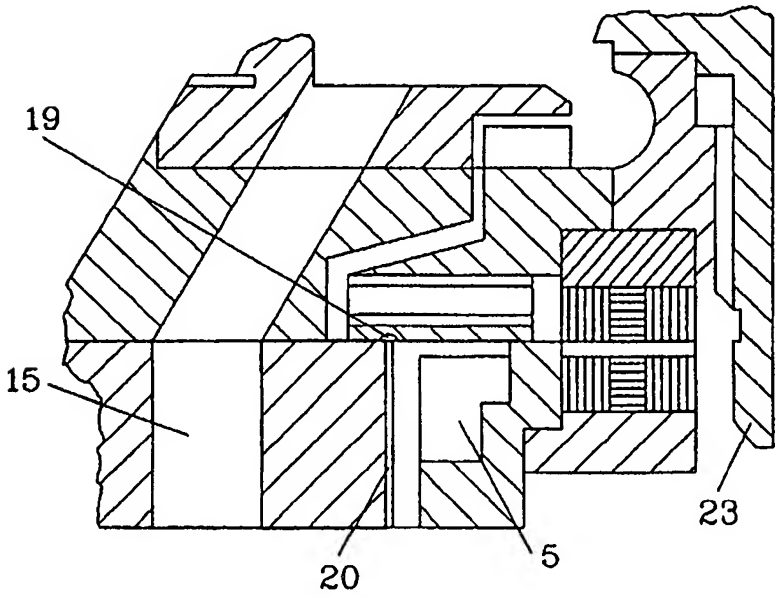


FIG.3

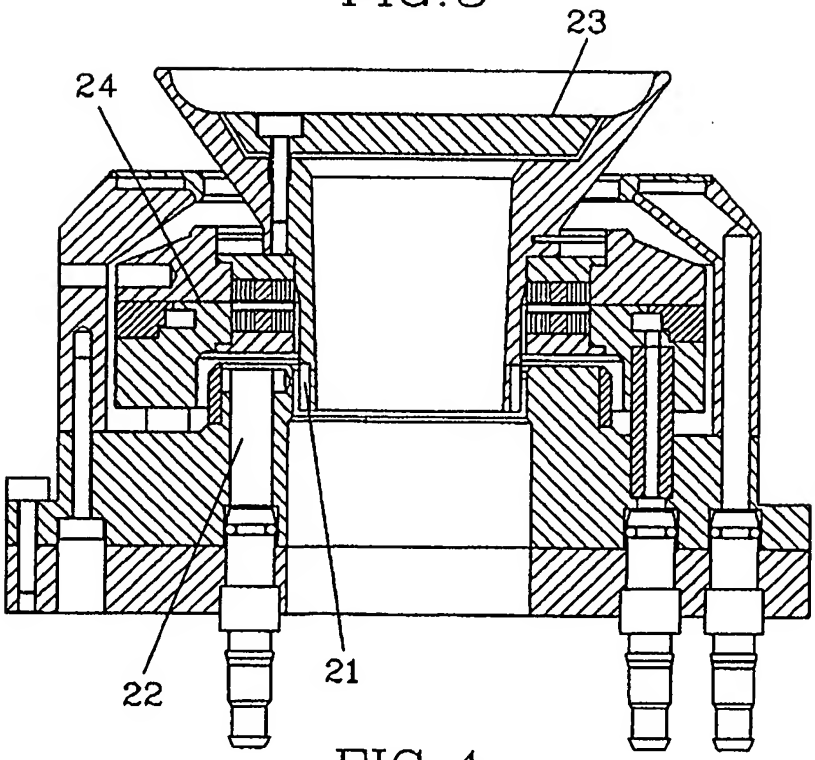
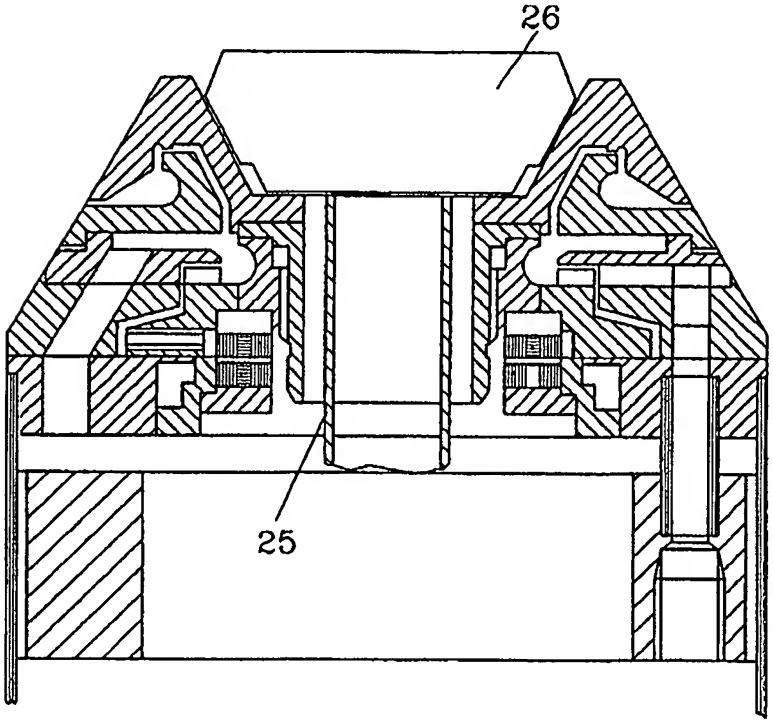


FIG.4



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EUROPEAN SEARCH REPORT

Application Number

EP 93 81 0289

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y A	EP-A-0 209 447 (SAMES) * page 8, line 7 - page 10, line 17; figure 1 *	1,2 3-6	B05B5/04 F16C32/06 B05B3/10
Y	DE-B-2 349 072 (SKF) * column 4, line 21 - line 56; figure 1 *	1,2	
D,A	US-A-4 467 968 (MORISHITA ET AL.) * the whole document *	1	
A	PATENT ABSTRACTS OF JAPAN vol. 010, no. 176 (M-491)20 June 1986 & JP-A-61 025 742 (NTN TOYO BEARING CO LTD) 4 February 1986 * abstract *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B05B F16C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 JUNE 1993	GUASTAVINO L.

CATEGORY OF CITED DOCUMENTS

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